ASSIGNMENT 7

Textbook Assignment: “Infrared,” chapter 6, pages 6-1 through 6-28.

7-1. Which of the following types of remote sensing is natural light photography?

1. Active only
2. Passive only
3. Active and passive
4. Interactive

7-2. What are the differences between IR waves and light, RF, and other electromagnetic waves?

1. Reflection and frequency
2. Refraction and absorption
3. Wavelengths and speed
4. Frequency and wavelengths

7-3. What is the IR frequency range?

1. 300 MHz to 400 GHz
2. 400 MHz to 300 GHz
3. 300 GHz to 400 THz
4. 400 GHz to 300 THz

7-4. The IR region lies between what wavelengths of the electromagnetic spectrum?

1. 1.00 and 7,200 nanometers
2. 1.00 and 7,200 micrometers
3. 0.72 and 1,000 nanometers
4. 0.72 and 1,000 micrometers

7-5. Thermal imaging is referenced in terms of

1. temperature
2. reflectivity
3. visible light
4. color

7-6. The types of IR imaging systems generally used are fast-framing, mechanical-scanning devices know as

1. BLIR
2. FLIR
3. SLIR
4. WLIR

IN ANSWERING QUESTION 7-7, REFER TO FIGURE 6-2 IN THE TEXTBOOK.

7-7. What effect does the atmosphere have on the target signal?

1. Attenuates and blurs the signal
2. Enhances and sharpens the signal
3. Attenuates and sharpens the signal
4. Enhances and blurs the signal

IN ANSWERING QUESTION 7-8, REFER TO TABLE 6-1 IN THE TEXTBOOK.

7-8. IR radiation is broken into how many total regions?

1. One
2. Two
3. Three
4. Four

IN ANSWERING QUESTION 7-9, REFER TO FIGURE 6-3 IN THE TEXTBOOK.

7-9. The best IR windows in the transmission spectrum of the atmosphere are between which of the following wavelengths?

1. 2 μm and 5 μm, 8 μm and 13 μm
2. 3 μm and 5 μm, 8 μm and 14 μm
3. 3 μm and 6 μm, 8 μm and 15 μm
4. 2 μm and 7 μm, 9 μm and 15 μm

7-10. All rotter emits IR radiation above what temperature?

1. -273°C
2. -273°F
3. 0°C
4. 0°F

7-11. If the temperature of a black body is increased 10 times, the IR radiation will be increased what number of times?

1. 100
2. 1,000
3. 10,000
4. 100,000

7-12. All materials commonly used in visible light optics are transparent at IR frequencies.

1. True
2. False

7-13. Which of the following qualities is desired in optical material used In IR imaging systems?

1. Transparent to visible light
2. High coefficient of thermal expansion
3. Low mechanical strength
4. High surface hardness

7-14. What optical materials, if any, have all of the qualities desired in IR optics?

1. Silicon, germanium, and zinc selenide
2. Silicon, germanium, and zinc sulfide
3. Silicon, zinc selenide, and zinc sulfide
4. None

7-15. What component in the JR imaging system is the most important?

1. Detector
2. Optic
3. Receiver
4. Sensor

7-16. A photographic film is an example of what type of detector?

1. Elemental
2. Imaging
3. Photon
4. Thermal

7-17. What type of energy-matter interaction involves the absorption of radiant energy in the detector?

1. Thermal effect
2. Photon effect
3. Elemental
4. Imaging

IN ANSWERING QUESTIONS 7-18 THROUGH 7-21, SELECT THE DESCRIPTION FROM COLUMN B THAT MATCHES THE TERM LISTED IN COLUMN A.

A. TERM	B. DESCRIPTION
7-18. Photon effect	1. Radiation causes photocathode surface electron emission to the surrounding space
7-19. Photoconductivity	
7-20. Photoelectric	
7-21. Photoemissive	
	2. Radiant energy photons interact directly with detector material
	3. Radiant energy changes detector material’s electrical conduction
	4. Radiant signal causes a difference of potential across a PN junction

IN ANSWERING QUESTIONS 7-22 THROUGH 7-25, SELECT THE COMPONENT FROM COLUMN B THAT MATCHES THE DESCRIPTION IN COLUMN A.

A. DESCRIPTION	B. COMPONENT
7-22. Collects the incoming energy and focuses the image at the detectors	1. Detectors
7-23. Converts the IR radiation signal into an electrical signal	2. Scene dissection system
7-24. Converts the data collected by the detectors into a video display	3. Front-end optics
7-25. Scans the scene image	4. Image processing system

7-26. What type of detector cooling system uses a heat exchanger and a compressor?

1. Tricycle
2. Quad-cycle
3. Closed-cycle
4. Opened-cycle

7-27. What term is synonymous with FLIR so far as system operation is concerned?

1. FIRS
2. IRDS
3. FLIRDS
4. IRFLDS

7-28. What assembly of a FLIR system converts IR energy into a usable video signal?

1. IRDS control
2. Power supply-video converter
3. Receiver-converter
4. Video indicator

7-29. What type of housing is used for the FLIR receiver-converter?

1. Forward section of a station-mounted FLIR pod only
2. Separate pod mounted on the forward, lower aircraft fuselage only
3. Separate pod mounted on the aft, lower aircraft fuselage only
4. Dependent on the aircraft model

7-30. The FLIR receiver-converter breaks down functionally into how many total subsystems?

1. One
2. Two
3. Three
4. Four

7-31. In the wide FOV mode of operation, what components are NOT in the signal optical path?

1. The TV camera optics
2. The IR imaging optics
3. The afocal optic lenses
4. The visible collimating lenses

7-32. Changes in temperature of an optical lens changes what index?

1. Refraction
2. Reflection
3. Diffraction
4. Deflection

7-33. The bottom side of the scan mirror scans the visible light signals and reflects the signal into what component?

1. The visible collimating lens
2. The afocal optics unit
3. The TV camera optics
4. The IR imaging optics

7-34. A scan mirror is indexed three line widths in the vertical direction, making a total of 400 lines of video, with only 100 detectors and amplifier channels. What is the interlacing ratio?

1. 4:1
2. 3:1
3. 2:1
4. 1:1

7-35. For proper operation, the IR detectors are kept at what temperature level?

1. 0°C
2. 0°F
3. Cryogenic
4. Carcinogenic

7-36. For each IR detector within the array, the video amplifier module contains one preamplifier and three postamplifiers for which of the following purposes?

1. To decrease the video interference
2. To increase the IR signal to a useable level
3. To Increase the video ac level
4. All the above

7-37. The output of the LED array is applied to what unit?

1. The reticle optics
2. The IR imaging optics
3. The collimating lens
4. The afocal lens

7-38. A light signal is applied to the TV camera to indicate the receiving head position from what unit?

1. The reticle optics
2. The IR imaging optics
3. The collimating lens
4. The afocal lens

7-39. The FLIR heat exchanger supplies conditioned air to what assembly for environmental control?

1. Power supply-video converter
2. Control servomechanism
3. Target tracking sight control
4. Receiver-converter

IN ANSWERING QUESTIONS 7-40 AND 7-41, REFER TO FIGURE 6-14 IN THE TEXTBOOK.

7-40. B-1 operates when which of the following conditions occurs?

1. The FLIR system is turned on
2. K-1 is energized
3. K-2 is energized
4. K-3 is energized

7-41. B-2 operates when which of the following conditions occurs?

1. The FLIR system is turned on
2. K-1 is energized
3. K-2 is energized
4. K-3 is energized

7-42. The FLIR heat exchanger will maintain the receiver-converter compartment at what temperature range?

1. 50°F to 68°F
2. 50°C to 68°C
3. 68°F to 77°F
4. 68°C to 77°C

7-43. Which of the following is a function of the receiver-converter stabilized gimbal subsystem?

1. To ensure coolant fluids are not spilled
2. To maintain a steady image of IR patterns
3. To ensure stabilized operating temperatures
4. To maintain constant LOS with the nose of the aircraft

7-44. Azimuth and elevation commands are processed, and then applied to the receiver head positioning motors and gimbals by what WRA?

1. Receiver-converter
2. Control servomechanism
3. Target tracking sight control
4. Power supply-video converter

7-45. The CS assembly inhibits the stabilization system when LOS of the receiver is operated by what component?

1. An aircraft computer,
2. Target tracking sight control
3. IR detecting set control
4. FLIR detecting set control

7-46. The BITE logic module is located in what assembly?

1. Power supply-video converter
2. Control servomechanism
3. Video indicator
4. Target tracking sight control

7-47. What subsystem Is NOT a power supply-video converter subsystem?

1. Power supply
2. BITE
3. Video processing
4. Scan and interlace

7-48. Receiver-converter synchronizing drive and timing signals are generated by what power supply-video converter subsystem?

1. Power supply
2. BITE
3. Video processing
4. Scan and interlacing

7-49. Gray scale video is displayed on the indicator as ten different shades of gray. The operator uses these shades of gray to perform which of the following actions?

1. Estimate the depth of the target
2. Calibrate the camera assembly
3. Estimate the target's temperature
4. Calibrate the TTSC

7-50. The video processor receives raw video signals from what device?

1. The LED array
2. The TV camera
3. The sync generator control
4. The scanning mirror

7-51. In the BITE mode of operation, a signal is generated to indicate that the sync generator has failed. This signal is generated by what BITE module?

1. Receiver-converter
2. TV video
3. IRDSC
4. CS

7-52. To position the receiver head, the position and rate commands from the IRDSC are processed as

1. analog drive signals
2. digital drive signals
3. clamped dc averages
4. sync voltage pulses

7-53. In the position mode, the azimuth drive signal is amplified to a signal large enough to drive the receiver head azimuth motor by what azimuth module?

1. Mode logic
2. Position compensation
3. Rate compensation
4. Heat sink

7-54. In the FWD mode of operation the receiver head is driven to what azimuth position?

1. 0°
2. 45°
3. 90°
4. 180°

7-55. What signal enables the azimuth rate compensation module to accept azimuth position rate signals from the D/A converter only?

1. Computer track command
2. Rate compensation
3. Decoder conversion
4. Gimbal control

7-56. What is the primary difference between the azimuth and elevation drive subsystems?

1. Manual override is only used for azimuth
2. A computer is not used for azimuth
3. Tachometer feedback is not used in elevation circuitry
4. Gimbal drive circuitry is different

7-57. In the FWD mode of operation, the receiver head is slewed to what elevation position?

1. 0°
2. -2°
3. -3°
4. -4°

7-58. What is the primary function of the control servomechanism BITE subsystem?

1. To maintain constant servo sync pulses
2. To automatically locate servo-system failures
3. To isolate component failures
4. To convert computer Inputs to gimbal bits

7-59. When a BITE initiate signal is started, each test sequence lasts what approximate length of time?

1. 10 to 12 seconds
2. 15 to 17 seconds
3. 20 to 22 seconds
4. 25 to 27 seconds

7-60. During the fault isolate test, the DCI fault isolate signal goes to mode logic and

1. coder storage module
2. decoder storage module
3. clock module
4. memory module

7-61. During BITE 1 test, the receiver head is slewed to what position?

1. 0° azimuth and 0° elevation
2. 0° azimuth and 4° elevation
3. 0° azimuth and -4° elevation
4. 4° azimuth and -4° elevation

7-62. During BITE 2 test, the receiver head is slewed to what position?

1. 60° azimuth and -130° elevation
2. 60° azimuth and 130° elevation
3. 130° azimuth and -60° elevation
4. 130° azimuth and 60° elevation

7-63. The TTSC is used in what mode of operation?

1. Computer
2. Azimuth
3. Elevation
4. Manual

7-64. Adjusting the thumb control on the TTSC produces voltage outputs from which of the following transducer?

1. Rate and climb angle
2. Climb and azimuth angle
3. Elevation and rate angle
4. Elevation and azimuth angle

IN ANSWERING QUESTIONS 7-65 THROUGH 7-67, REFER TO FIGURE 6-26 IN THE TEXTBOOK.

7-65. With the MODE switch in the STBY position, the receiver head is stowed in what position?

1. CW and up limits
2. CCW and up limits
3. CW and down limits
4. CCW and down limits

7-66. The FOV switch selects either a wide or narrow field of view by switching what assembly in or out of the receiver's optical path?

1. The afocal lens
2. The collimating lens
3. The imaging optics
4. The camera optics

7-67. The brightness of the reticle that is superimposed on the video signal applied to the video indicator is controlled by what knob?

1. GAIN
2. LEVEL
3. RTCL BRT
4. WHT HOT

7-68. When a failure occurs in the video indicator, what module extinguishes the STATUS light?

1. Sweep heat sink
2. Video line driver
3. Video amplifier/sync stripper
4. Vertical and horizontal sweep